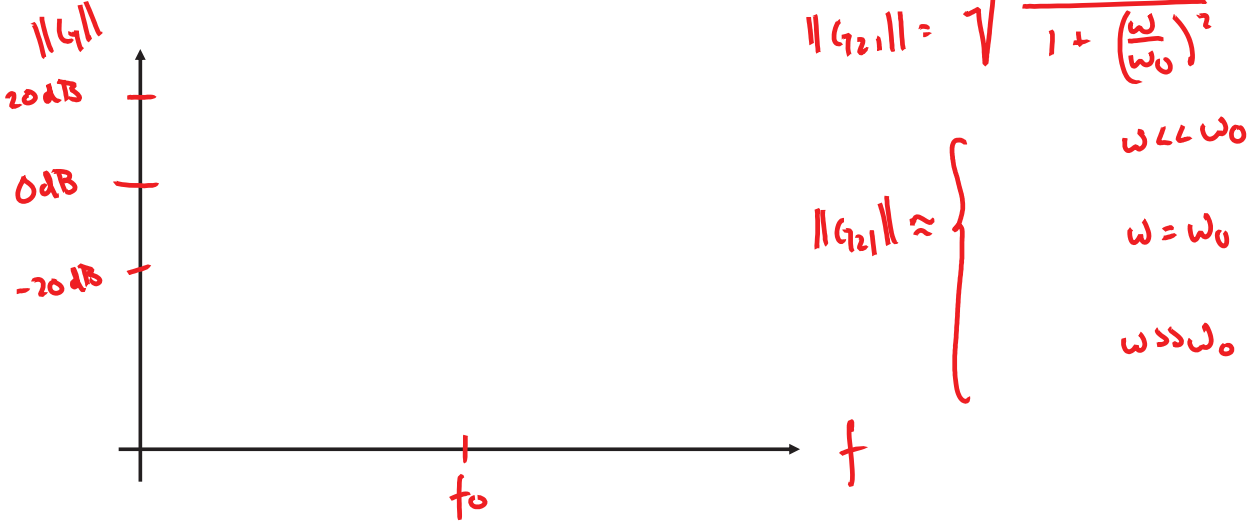
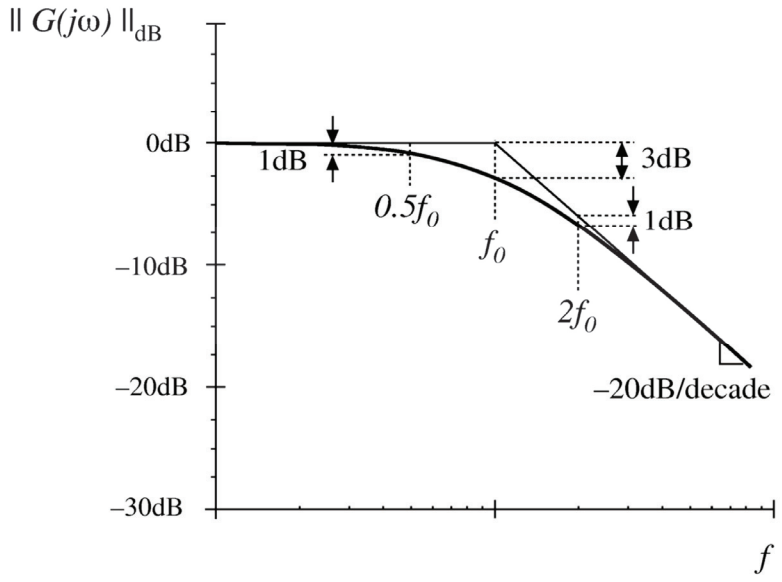
Plotting a Single Pole Response



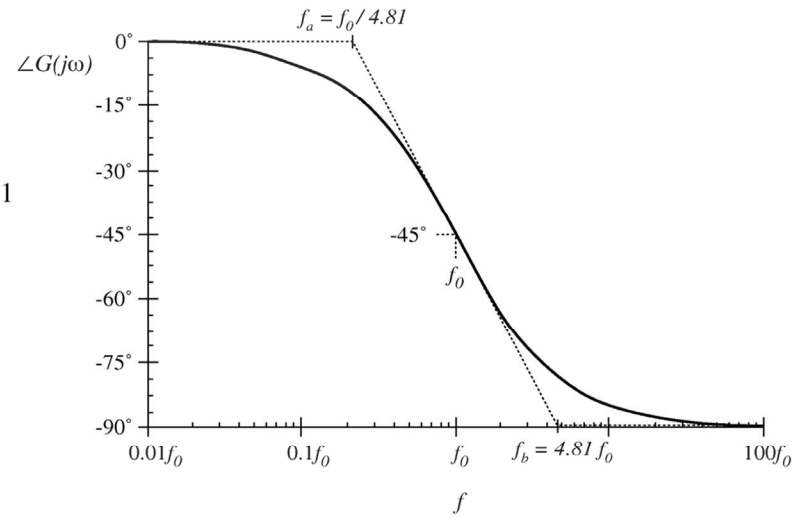
Summary: Single Pole Magnitude



Phase of Single Pole

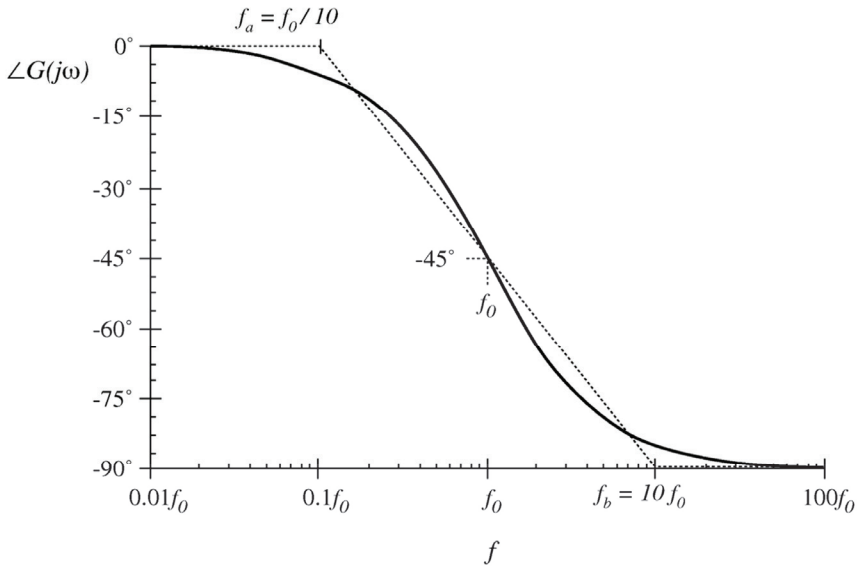
Phase Asymptotes

$$f_a = f_0\, e^{-\pi/2} \approx f_0 / 4.81$$
$$f_b = f_0\, e^{\pi/2} \approx 4.81\, f_0$$

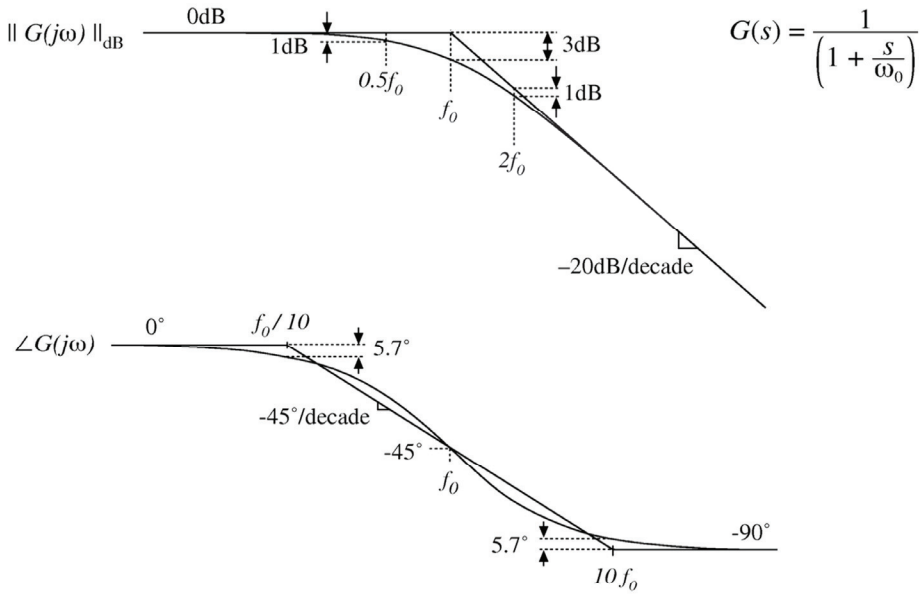


Phase Asymptotes: A Simpler Choice

$f_a = f_0 / 10$
$f_b = 10\ f_0$

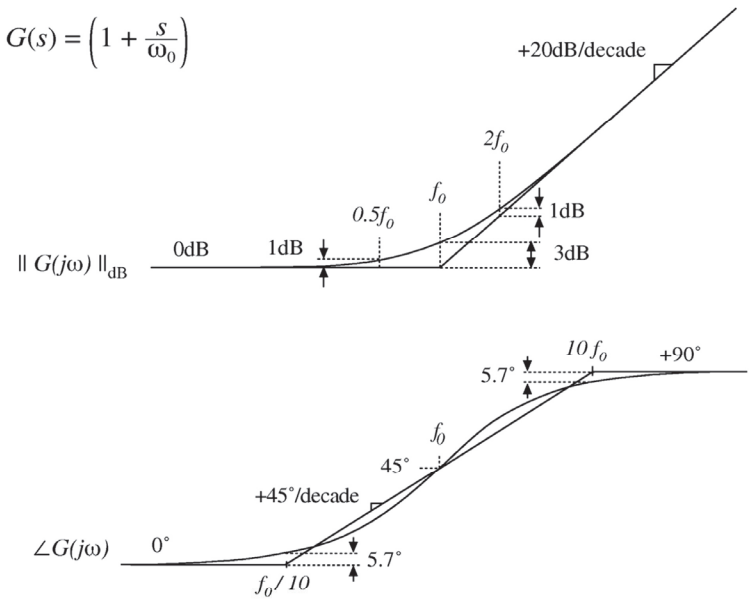


Summary: Single Real Pole

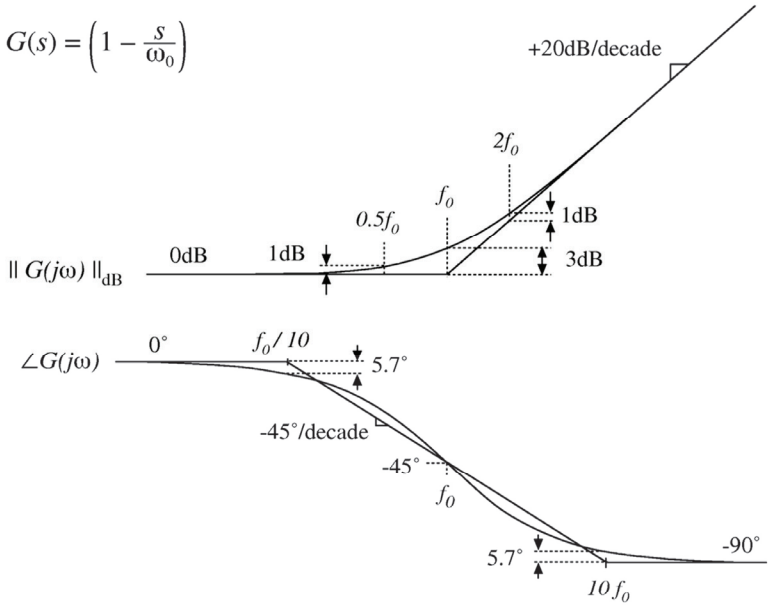


$$G(s) = \frac{1}{\left(1 + \frac{s}{\omega_0}\right)}$$

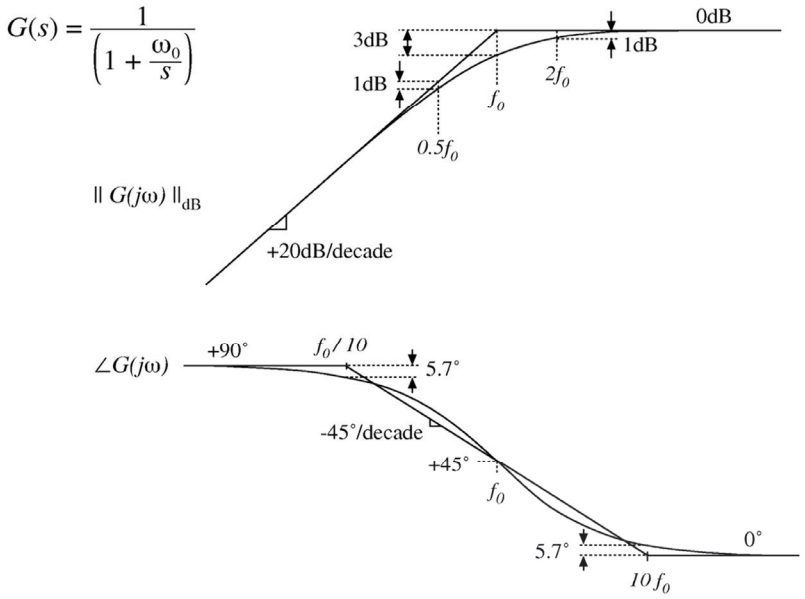
Bode Plot: Real Zero



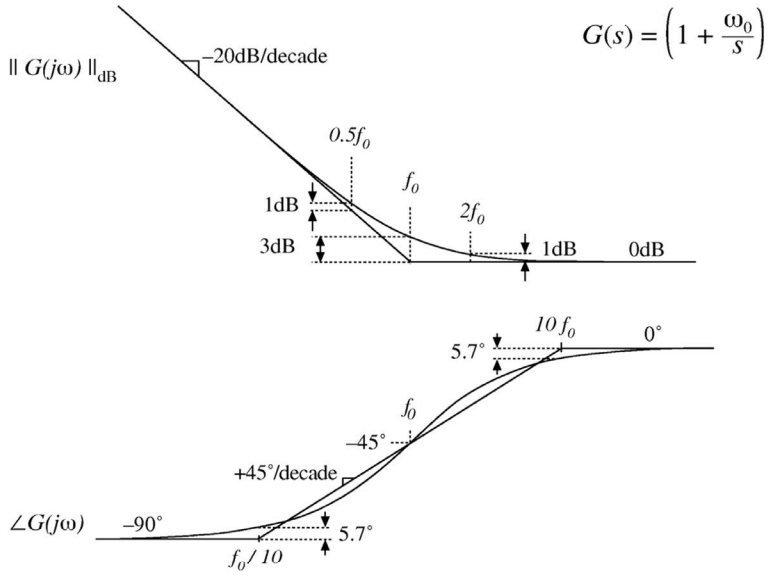
RHP Zero



Inverted Pole



Inverted Zero

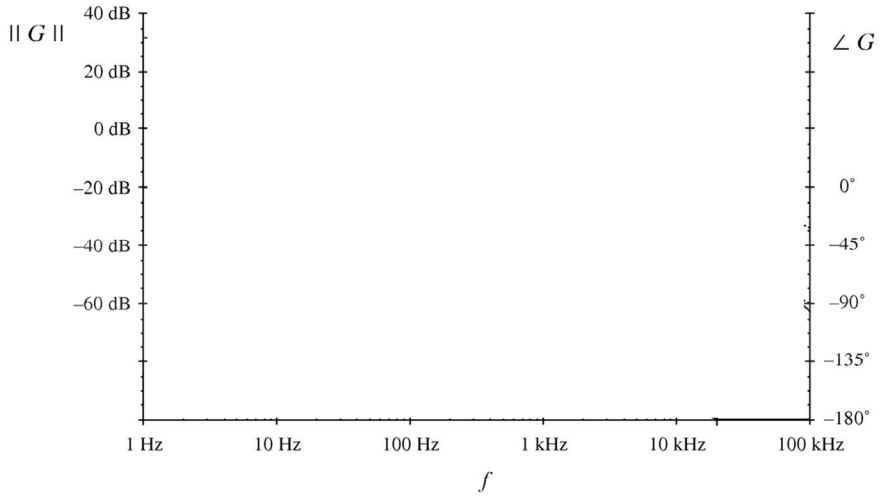


Multiplying Transfer Functions

Example 1

$$G(s) = \frac{G_0}{\left(1 + \frac{s}{\omega_1}\right)\left(1 + \frac{s}{\omega_2}\right)}$$

with $G_0 = 40 \Rightarrow 32$ dB, $f_1 = \omega_1/2\pi = 100$ Hz, $f_2 = \omega_2/2\pi = 2$ kHz



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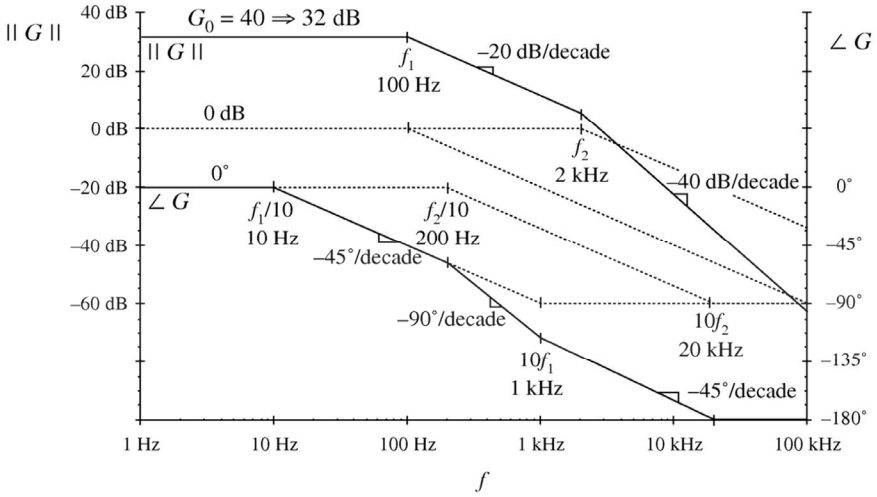
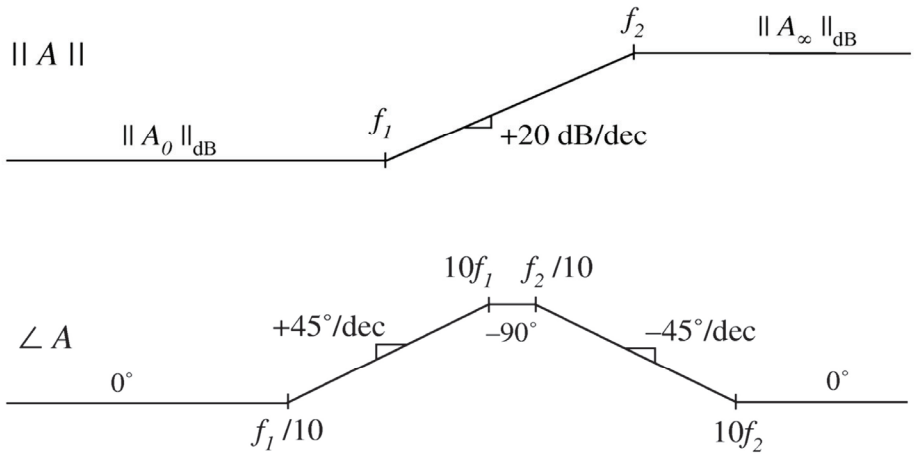


Example 2

Determine the transfer function $A(s)$ corresponding to the following asymptotes:



Example 3